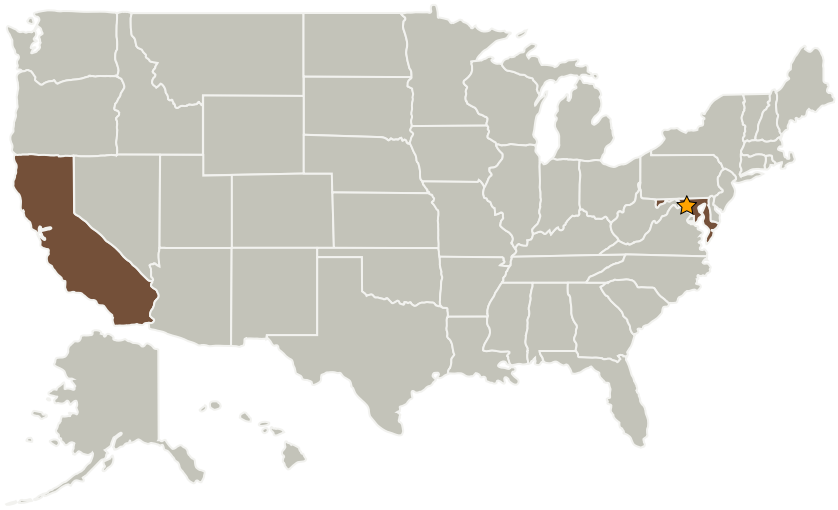
Miniature Turbine for Pulse-Tube/Reverse-Brayton Hybrid Cryocooler, Phase I

Completed Technology Project (2004 - 2004)

Project Introduction

Many future advances in NASA's ability to perform cutting edge space science will require improvements in cryogenic system technology, including the development of light-weight, low vibration, highly-efficient, long-life cryocoolers. One such cooler, currently under development, is the pulse-tube/reverse-Brayton (PT/RB) hybrid cooler. Of critical importance to success of the PT/RB is the development of the small-scale turbine required for the reverse-Brayton stage. We propose to build such a turbine for inclusion in a brassboard PT/RB soon to be constructed under a separate contract. The turbine will incorporate pressurized bearings that generate a supporting force by applying a high-pressure source of gas to a flow restriction that exhausts into the bearing clearance and onto the turbine shaft surface. Pressurized bearings provide support even in the absence of shaft rotation and therefore eliminate rubbing contact and increase the life and reliability of the bearing. Also, because pressurized bearings do not directly depend on viscous action for operation, relatively larger clearances can be used without significantly sacrificing rotordynamic performance at low temperatures, thus making them cost effective.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Atlas Scientific	Supporting Organization	Industry	San Jose, California

Primary U.S. Work Locations	
California	Maryland

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

James Maddocks

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.3 Aero Propulsion
    - TX01.3.2 Turbine Based Combined Cycle